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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/038,806	01/02/2002	Timothy M. Takeuchi	42P13557	2936

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EXAMINER

VU, QUANG D

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 09/06/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/038,806		TAKEUCHI, TIMOTHY M.	
	Examiner		Art Unit	
	Quang D Vu		2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>1</u> . | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-6, drawn to method of mounting an integrated circuit on package substrate, classified in class 438, subclass 122.
- II. Claims 7-23, drawn to apparatus, classified in class 257, subclass 697.

During a telephone conversation with Travis John on 08/14/2002 a provisional election was made without traverse to prosecute the invention of group I, claims 7-23. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-6 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 7-8, 10-13, 15 and 18-20 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent No. 6,118,177 to Lischner et al.

Regarding claim 7, Lischner et al. teach an apparatus comprising:

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a package substrate (100) having top (136) and bottom (126) surface buildup layers disposed on a thermally conductive substrate core (readable on the layers 120, 125 and the intervening layers), wherein a portion of the substrate core is exposed at a top surface of the package substrate to allow for attachment of a heat spreader (140) (see figure 1; column 2, lines 18-50).

Regarding claim 8, Lischner et al. teach the exposed portion of the substrate core extends around the perimeter of the top surface buildup layers (see figure 1).

Regarding claim 10, Lischner et al. teach an apparatus comprising:

a package substrate (100) having top and bottom surface buildup layers disposed on a thermally conductive substrate core (readable on the layers 120, 125 and the intervening layers);

an integrated circuit (130) having a top surface and a backside surface, the integrated circuit mounted on a top surface of the package substrate with the top surface of the integrated circuit facing down; and

a heat spreader (140) thermally coupled to the substrate core, a bottom surface of the heat spreader thermally coupled to the backside surface of the integrated circuit (see figures 1 and 3; column 2, line 18 – column 4, line 22).

Regarding claim 11, Lischner et al. teach the heat spreader is thermally coupled to a perimeter portion of the substrate core (see figures 1 and 3; column 2, lines 45-50; column 2, line 64 – column 3, line 5).

Regarding claim 12, Lischner et al. teach the heat spreader is soldered to the substrate core (see figures 1 and 3; column 3, lines 32-35).

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Regarding claim 13, Lischner et al. teach the heat spreader is made of metal (column 2, lines 64-67).

Regarding claim 15, Lischner et al. teach a thermal interface material (142) disposed between the backside surface of the integrated circuit and the bottom surface of the heat spreader (see figures 1 and 3; column 2, lines 45-48).

Regarding claim 18, Lischner et al. teach the integrated circuit is mechanically and electrically coupled to the package substrate by a plurality of solder bump interconnections (see figures 1 and 3; column 2, lines 28-33).

Regarding claim 19, Lischner et al. teach a printed circuit board, wherein the package substrate is mounted on the printed circuit board (see figure 1; column 3, lines 49-53).

Regarding claim 20, Lischner et al. teach the package substrate is mechanically and electrically coupled to the printed circuit board by a plurality of solder bump interconnections (see figure 1; column 3, lines 49-58).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 9, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,118,177 to Lischner et al. in view of US Patent No. 6,178,093 to Bhatt et al.

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Regarding claims 9 and 14, Lischner et al. do not teach the substrate core is made of metal. Lischner et al. teach organic substrate. However, Bhatt et al. teach the substrate is made of metal (column 3, line 66 – column 4, line 10). Therefore, it would have been obvious design choice to one having ordinary skill in the art at the time the invention was made to select either organic or metal substrate.

5. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,118,177 to Lischner et al. as applied to claim 10 above, and further in view of US Patent No. 6,229,204 to Hembree.

Regarding claim 16, Lischner et al. teach that convenient surfaces are provided for placement of a heat sink (column 4, lines 52-53). Lischner et al. do not teach a heat sink attached to a top surface of the heat spreader. However, Hembree teaches a heat sink attached to a top surface of the heat spreader (see figures 5 and 6). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teaching of Hembree into the device taught by Lischner et al. since it is desirable to enhance heat dissipation.

Regarding claim 17, Lischner et al. do not teach a fan attached to the heat sink. However, Hembree teaches a fan attached to the heat sink (column 4, lines 13-14). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teaching of Hembree into the device taught by Lischner et al. since it is desirable to increase heat dissipation.

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6. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,118,177 to Lischner et al. in view of US Patent No. 4,561,011 to Kohara et al.

Regarding claim 21, Lischner et al. teach a package substrate having top and bottom surface buildup layers disposed on a thermally conductive substrate core; integrated circuits having top surfaces and backside surfaces, the integrated circuit mounted on a top surface of the package substrate with the top surfaces of the integrated circuits facing down; and a heat spreader thermally coupled to the substrate core, wherein a bottom surface of the heat spreader is thermally coupled to the backside surfaces of the integrated circuit (see figures 1 and 3).

Lischner et al. do not teach at least two integrated circuits having top surfaces and backside surfaces, the integrated circuits mounted on a top surface of the package substrate with the top surfaces of the integrated circuits facing down. However, Kohara et al. teach at least two integrated circuits having top surfaces and backside surfaces, the integrated circuits mounted on a top surface of the package substrate with the top surfaces of the integrated circuits facing down (see figures 1, 3). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select a plurality of chips, since it is desirable to produce plurality of chips to enable the device to be used for a plurality of purposes.

Regarding claim 23, Lischner et al. teach the heat spreader is soldered to the substrate core (see figures 1 and 3).

6. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lischner et al. and Kohara et al. as applied to claim 21 above, and further in view of US Patent No. 6,215,670 to Khandros.

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Regarding claim 22, neither Lischner et al. nor Kohara et al. teach one or more capacitors mounted on a top surface of the package substrate. However, Khandros teaches one or more capacitors mounted on a top surface of the package substrate (column 12, lines 40-43; lines 48-50). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate the teaching of Khandros into the device taught by Lischner et al. or Kohara et al., since it is desirable to improve electrical performance of semiconductor devices operating at high frequencies.

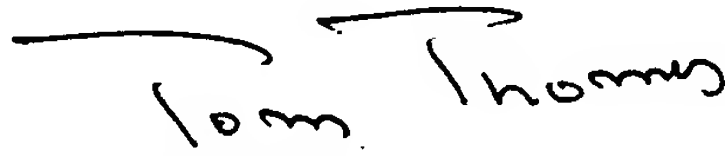
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quang D Vu whose telephone number is 703-305-3826. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

QVU
September 3, 2002


TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800